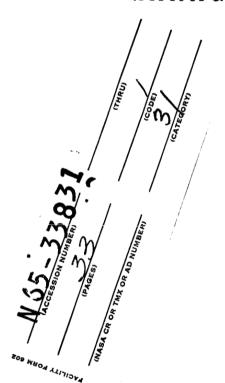
OFFICE OF MANNED SPACE FLIGHT

APOLLO PROGRAM

ELECTRICAL POWER - MANAGEMENT SURVEY MANUAL



SEPTEMBER 1, 1965



GPO PRICE \$ ______CSFTI PRICE(S) \$ ________

Microfiche (MF)

ff 653 July 65

PREPARED BY APOLLO PROGRAM OFFICE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

ELECTRICAL POWER MANAGEMENT SURVEY MANUAL

September 1, 1965

Performance Analysis and Control Apollo Program Office National Aeronautics and Space Administration Washington, D.C. 20546

Abstract

33831

The Electrical Power Management Survey Manual provides procedures for a management audit of NASA Apollo Program contractor activities, assesses performance towards objectives, evaluates effectiveness of the management system, and where weaknesses exist, it provides a tool for determining corrective action. This amplifies Electrical Power Management Standard NASA SP-6005, June 15, 1965.

TABLE OF CONTENTS

Introduction	1
Why This Effort?	1
Utilizing the Results	2
Objectives	2
Policies	2
Technical Approach	2
Team Function	3
Prerequisites	3
Plans	3
Team Selection (step one)	3
Initial Meeting (step two)	4
Team Actions (step three)	4
Team Meeting (prior) (step four)	6
Initial Meeting with Contractor (ste	ep five) 7
Team Meeting (following) (step six)) 7
Final Meeting with Contractor (step	p seven) 7
Team Actions (step eight)	7
Completion of Assignment (step nir	ne) 8
Standards of Measurable Performance	8
The Proficiency Rating (PR)	8
The Evaluation Technique	8
Rating the Answers	9
A Final Word	g
Table I Evaluation Questions	12-27
Table II Proficiency Rating Form	29
Table III Final Report, Sample Outline	30

INTRODUCTION

To assure effective planning, optimization, and control of the Apollo Space Vehicle electrical power management program, it is imperative that each center, contractor, and sub-contractor develop and maintain efficient electrical power management systems. Confidence in the effectiveness of the electrical power management program can only be assured by the qualitative evaluation of the adequacy of the established electrical power management systems. Such evaluations, to be practical and worthwhile, must include the necessary elements of planning, conducting, reporting, and follow-up.

This manual is presented as an aid in meeting the requirements of those NASA managers concerned with functions related to electrical power management and as such provides guidance, procedures, instructions, and work sheets for surveillance as well as more thorough periodic management surveys.

This manual was prepared by the Performance Analysis and Control Office (Code MAP-2) of the Apollo Program Office, NASA, Washington, D.C.

The techniques developed herein can readily be converted to meet evaluation requirements in other areas, e.g., the Weight/Performance Management Survey Manual, (NASA SP-6006). Instrumentation, thermal control and vibration, shock, and acoustics are other typical examples.

WHY THIS EFFORT?

In the interest of attaining true program electrical power management this formal management survey provides an audit of NASA and contractor activities, assesses performance toward objectives, evaluates effectiveness of relationships between participating organizations and, where problems exist, provides a tool for determining corrective action.

Prior to assessing a electrical power management system it is necessary to specify:

Objectives

The results of the management survey must provide a full measure of current and projected status, identify weaknesses, and establish remedial actions.

Policies

Basic ground rules or guides must provide assurance that desired goals and objectives will be attained.

Plans

It is necessary to transform the objectives and policies into a systematic working document which delineates a realistic schedule of survey events, identifies areas of concern, and establishes a technical and administrative approach.

Standards of Measurable Performance

The results of the survey must be expressed in readily recognizable quantitative terms, preferably a proficiency rating (PR).

UTILIZING THE RESULTS

The survey will provide results which define the administrative as well as the engineering deficiencies. Accordingly, cognizant NASA managers will obtain valuable insight into existing and probable contractor weaknesses; and will be in a better position to take actions essential to the solution of electrical power management problems.

The ultimate worth of the obtained results will be a direct function of the effort extended by the survey team in planning and executing its assigned task.

OBJECTIVES

Six areas of concern must be investigated to ascertain electrical power management system status, weaknesses, and desired remedial actions. They are:

- a. Planning: Recognition and proper phasing of each and every action necessary to attain electrical power objectives.
- b. Communications: Policies and procedures (instructions, work orders, information flow system, etc.) defining authorities and responsibilities sufficiently to direct, control, conduct, and administer the electrical power management system.
- c. Disciplines: Adequacy of managerial discipline and organization in requiring compliance with plans, policies, and procedures necessary to attain electrical power management objectives.
- d. Training and Education: Sufficiency of details of who, why, what, when, where, and how of electrical power management provided to responsible personnel at all levels.
- e. Judgments: Soundness, prudence, and practicality of decisions made in carrying out the electrical power management system plans, policies, procedures, information flow, and technical aspects.
- f. Technical knowledge and ability to perform engineering functions, including electrical power analyses and evaluations of system performance, in compliance with specifications and standards.

These areas of concern can be measured quantitatively through an analysis, based on a series of evaluation questions, resulting in an overall "Proficiency Rating." This is covered in detail in the "Standards of Measurable Performance" section.

POLICIES

Technical Approach

The evaluations will be accomplished by a team of responsible representatives of cognizant center engineering groups, and supported by the MSF/Apollo Program Office in the role of amicus curiae. The evaluation consists of nine steps, starting with the selection of the team, and ending with the final report containing the results of all action items.

Team Function

Each team member will be assigned primary and secondary areas of responsibility. He will, at the conclusion of the evaluation, prepare an informal report for the chairman, covering his primary area of responsibility, and critique the report covering his secondary area of responsibility. The final report is prepared by the chairman, and critiqued by the team members. The chairman is also responsible for scheduling the events and meetings required for the evaluation, and for making necessary arrangements with the contractor.

Prerequisites

The evaluation of any area of a contract is a task which must, once the decision is made to proceed, be accomplished with a minimum perturbation to the contractor's effort. The evaluation team, to properly discharge its responsibilities, must be fully and completely prepared for the task; therefore, the prerequisites are an essential part of the evaluation. How the evaluation goes, and how successful the team is, will depend entirely on how well they are prepared.

Modus Operandi

The evaluation shall be conducted in nine basic steps, starting with the selection of the team members and ending with the submittal of the final report. Therefore, adherence to the basic procedures is strongly recommended for consistency and assistance in the required follow-on actions.

The prerequisites, agenda, and work sheets presented should be critiqued and amended for applicability to the particular contract being evaluated. The relative importance of the six areas (noted under "objectives") should be established and noted on the work sheets of Table I prior to the evaluation.

End Item Reports

An objective summary of the evaluation, emphasizing the areas of concern, will be prepared for management immediately following the evaluation. This summary will, in addition to reviewing the actual evaluation, contain a complete listing of all incomplete action items, with a schedule for resolution. A complete report will follow the summary after all action items are complete, and will contain additional recommendations and a follow-up schedule.

Follow-up

Follow-up evaluations should be conducted by the same team, whenever possible, to determine the effectiveness of the recommendations and action items, and to provide continuous surveillance of the program.

PLANS

Team Selection (step one)

It is desirable to utilize a small group of competent individuals with the team chairman from the cognizant project or chief engineer's office. Suggested areas of team specialist representation and responsibility are:

- A. Electrical Power Management
- B. Electrical Power Design Groups
- C. Systems Engineering
- D. Contracts
- E. Project Office

Initial Meeting (step two)

An initial meeting of the team is required to:

- A. Explain the objectives of the evaluation, and the responsibilities of team members.
 - B. Make assignments of primary and secondary areas of responsibility.
- C. Establish a schedule of events for the evaluation. (This will provide each team member with the relationship of his inputs to those of the other team members.)
 - D. Prepare a preliminary agenda for the meeting with the contractor.

Team Actions (step three)

In accordance with the developed schedule it is necessary to assure that: (1) sufficient background data will be available for the team members to prepare for the visit to the contractor's facility, and (2) the contractor will have sufficient time to respond to the notice of evaluation. To accomplish these objectives adequately, the following items should be considered:

- I. The chairman informs the contractor, through official channels, of the evaluation, including objectives and expected cooperation. Notification will include:
- A. Definite date of team visit to contractor's facility in accordance with the developed schedule.
- B. A preliminary agenda, with a request for additional items that the contractor considers relevant to such an evaluation, and schedule for submittal.
- II. The chairman prepares, and distributes to the team members, a preliminary outline of the final report. See Table III for Sample Outline.
- III. Team members compile:
 - A. Background data in support of the survey agenda and final report.
- 1. CONTRACT REQUIREMENTS Exact requirements imposed on the contractor and delineation of information on informal or working agreements; control requirements imposed on the contractor (e.g., NASA SP-6005 Electrical Power Management Standard or equivalent), submittal requirements and specification requirements.

2. RESPONSE TO REQUIREMENTS

- a. Evaluation of submittals (Should include completeness, validity, and timeliness of submitted data.)
- b. Supplemental data Does the contractor respond to requests for supplemental data?

3. COMPARATIVE DATA

- a. Trend relationship between contractor-submitted data and contractual requirements.
 - b. Compatibility of measured data with calculated and estimated data.

4. PROBLEM AREAS

- a. Current, past, and possible future problems based on NASA/Contractor relationships to date.
 - b. Remedial actions and their effectiveness in solution of prior problems.
- B. Detail outline of informal report of assigned area of responsibility in accordance with the preliminary final report outline noted in II above.

IV. Agenda

The chairman prepares final agenda, with supporting checklist, considering contractor's response to request for additional items.

A. Purpose

1. The agenda shall cover the steps which are necessary to obtain and substantiate the answers to questions covering all classifications in the Qualitative Evaluation Sheets.

B. Recommended Basic Agenda

1. SESSION I

- a. Attendees
 - (1) NASA personnel
 - (2) Contractor personnel

b. Purpose

- (1) Chairman will discuss agenda items, purpose of evaluation, and anticipated results.
- (2) Contractor personnel will present to NASA the material which they have prepared to assist in the survey.

2. SESSION II

a. Attendees

(1) Session II will consist of separate simultaneous sessions of NASA personnel responsible for each Classification, meeting with contractor personnel cognizant in each Classification.

b. Purpose

- (1) Discuss in detail each Classification of Electrical Power Management. Obtain answers to all questions in Qualitative Evaluation Sheet for each Classification.
- (2) Examine substantiating evidence for answers to questions, where applicable, (i.e.,records of deliveries and documentation submittals, test equipment calibration records, substantiation of vendor and subcontractor electrical power management sufficiency, etc.)

3. SESSION III

a. Attendees

- (1) All personnel present at Session I.
- (2) Any additional personnel as determined to be necessary to meet the purpose of Session $\rm III$.

b. Purpose

- (1) Clear up any questions remaining unanswered by Session Π , particularly in areas involving interfaces among Classifications. (May include additional presentations, therefore a time allocation should be made to cover this contingency.)
- (2) Resolve any conflicts between question answers and substantiating evidence.
- (3) Assign Action Items to Contractor by NASA where necessary to substantiate or clear up any items as required to meet all requirements of the survey.
 - (4) Summation of survey activities.
- V. Final agenda is provided to team members and contractor.

Team Meeting (step four)

- A. Review by the chairman of the objectives, responsibilities, and assignments.
- B. Review the agenda, and make any adjustments required as a result of investigations made in the development of the background data, and contractor's response to notification of evaluation.

C. Background data distributed to team, accompanied by any discussion necessary for clarity and understanding by the team members.

Initial Meeting with Contractor (step five)

- A. Chairman discusses purpose and scope of survey (Session I of agenda).
- B. The contractor makes his presentation in accordance with the requirements of Session I of the agenda.
- C. Team specialists hold "depth interviews" (Session Π of agenda) with contractor representatives.

Team Meeting (step six - Held immediately following Session II of agenda).

- A. Review of findings, with a determination of:
 - 1. Items not covered.
 - 2. Items covered, but not to the satisfaction of team specialists.
 - 3. New items, resulting from initial meeting with contractor.
- B. Notification to contractor of:
 - 1. Additional presentations required.
 - 2. "Depth interviews" with specific individuals or groups required.
- ${\tt C}$. Identification of all action items with assignment of responsibility for resolution and/or recommendations .

Final Meeting with Contractor (step seven)

- A. Additional presentations and/or "depth interviews" with cognizant contractor representatives. (First item of Session III of Agenda.)
- B. Assignment of action items, includes identification and scope of contractor or customer responsibility, and determination of schedule for a resolution or recommendation.

Team Actions (step eight, upon return to NASA installation)

- A. Resolution and/or recommendation of action items assigned.
- B. Draft of assigned informal report.
- C. Critique draft of secondary assignment.
- D. Submit any recommendations and/or comments relative to the evaluation.

Completion of Assignment (step nine)

- A. Chairman completes and edits final draft of report and summary of open items.
- B. Report submitted to distribution.

STANDARDS OF MEASURABLE PERFORMANCE

The Proficiency Rating

Placing a "Proficiency Rating" (PR) upon an organization and its electrical power management system requires a quantitative approach. To do this a set of 99 basic evaluation questions, Table I, have been assembled. These questions when answered and rated, result in both an administrative and an engineering PR rating. The administrative PR rating provides a measure of the contractor's planning, communications, discipline, training and education, judgment, and technical know-how. The engineering PR rating provides a measure of engineering management with respect to:

- 1. Preparedness and Attitudes
- 2. Formulation of Requirements
- 3. Formulation of the Electrical Power Management System
- 4. Electrical Power Analysis
- 5. Design Monitoring
- 6. Subcontractor and Vendor Surveillance
- 7. Measured Data
- 8. Electrical Power Control Assurance
- 9. Submittals

The results of the administrative and engineering evaluation allows the survey team to pinpoint weaknesses. It is through this media then, that NASA management can make constructive recommendations to the contractor. Additionally, the survey points out to NASA where contractual action should be taken to effectively resolve critical conditions.

The Evaluation Technique

The evaluation is relatively straight-forward in that the previously noted questions are used to determine the depth and scope of the contractor's electrical power management effort. The survey team may augment the basic questions with leading inquiries of greater detail, but the ultimate goal should always be to obtain responses to the basic question. Detailed probing will allow the team to rate the contractor's basic response in a more efficient manner. A word of caution is in order, however, since too many detail questions will only serve to cloud the issue.

Rating the Answers (See Table I)

To the right of each question there is a block similar to the one shown here. This is the answer rating block.



Since all basic questions require only a yes or no answer, the survey team's task becomes one of determining the quantitative worth of the yes or no response. This is accomplished by utilizing lead questions as previously noted and interpreting the answers quantitatively by rating them to the plus, middle, or negative side of yes (Y) or no (N). The survey team may circle one of the individual blocks during the course of the interview once the question is answered. For example:

v		_	N	
 1	D	+	IN	-

After the survey is completed the circled answers are rated numerically as follows:

	10	8	6	4	2	0
I	+	Y	-	+	N	-

For example, a negative yes is evaluated as six. A negative no is worth zero. The numerical value should be placed next to the circled block but only when the survey is completed. The maximum worth of any classification is ten times the number of questions. Therefore, if there are four questions the rating could vary between zero and forty, and is accomplished by adding the individual question ratings. The rating given to each classification is entered on the Proficiency Rating Form, Table II. Summing the individual totals and dividing by 990 results in an overall PR rating and completes the quantitative rating. The higher the PR the more adequate the contractor's electrical power management effort. The highest or best rating is 100 percent.

A Final Word

The proficiency rating so obtained is regarded as a sound measure of the depth and scope of the contractor's effort. However, there are times when a critical situation may exist and be so detrimental to project and program objectives that the proficiency rating cannot accentuate it adequately. For example, if a contractor is not submitting data (i.e., none at all) in accordance with NASA requirements, a special condition exists and warrants a special report which should immediately be brought to the attention of cognizant parties for corrective action. In essence, a contractor's effort may be efficient and expeditious but NASA cannot determine this unless it receives a tangible end product, namely the required submittals.

TABLE I

Evaluation Questions

QU	ALITATIVE EVALUATION NO	DATE	•
CE	NTER	CONTRACTOR	
CO	NTRACT NO	STAGE/MODULE	
RA	TING OFFICIAL	Name and Title	
Cla	ssification: 1. PREPAREDNESS AND	D ATTITUDES	
<u>Obj</u>	ective: To review the contractor's ov (These questions should be an	_	
a.	Planning (1) Was the contractor adequately p in accordance with the NASA age		+ Y - + N -
b.	Communications (1) Were contractor position and poresponses to NASA questions coment and engineering levels?		+ Y - + N -
c.	Disciplines (1) Did the contractor support the s assuring the availability of cogn answer inquiries or to acquire r tion?	izant personnel to	+ Y - + N -
d.	Training and Education (1) Was there an awareness at all m ing levels of the importance and power management?		+ Y - + N -
e.	Judgements (1) Were the responses to the major straightforward and sound rathe little foundation?		+ Y - + N -
f.	Technical (1) Was the contractor's preparatio aspects of the survey evident in and/or contractor prepared mat	detail discussions	+ Y - + N -

QUALIT	FATIVE EVALUATION NODA	ATE
CENTE	RCONTRACTO	R
CONTR	ACT NOSTAGE/MO	ODULE
RATINO	G OFFICIALName and	d Title
Classifi	ication: 2. FORMULATION OF REQUIREMENT	S
Objecti	ve: To determine the existence of requirements, cedures, and documentation essential to effected electrical power management.	
	Are electrical power requirements traceable the all levels of contractor and related NASA documents. (This includes contracts, standards, spetions, and substantiating reports as applicable contractors, sub-contractors, vendors, and goment furnished equipment.)	nenta- ecifica- to
b. Co. (1)	mmunications Are established electrical power requirements subsequent revisions expeditiously transmitted the cognizant engineering elements?	1 T 1 T 1 T 1 T 1 N 1 T
c. Dis	sciplines Are electrical power requirements and revision ordinated at all applicable contractor and NASA management and engineering levels?	
	aining and Education Does the contractor have documented procedur guidelines for implementing and maintaining an tive electrical power management?	
e. Ju	dgments Are the contractor's interpretations of docume requirements consistent with a governing Electrower Management Standard (SP-6005 or equiv	trical
f. Te	echnical Does the contractor have documented analyses evaluations which substantiate existing require	+ Y - + N -

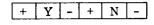
QUALIT	TATIVE EVALUATION NO	DATE	•
CENTE	R	CONTRACTOR	
CONTR	ACT NO	STAGE/MODULE	
RATING	GOFFICIAL	Name and Title	
Classif	ication: 3. FORMULATION C	F THE ELECTRICAL POWE	ER MANAGEMENT
Objecti	ve: To establish the depth and organization, and control management system.		
a. Pla (1)	and milestone schedule) elec	•	+ Y - + N -
(2)	program? Does the plan provide for stumenting, reporting, and commenced and commenced are students.	· -	+ Y - + N -
(3)	properties? Does the plan provide for au (or other acceptable account sign-offs, measurements, as a contract of the contract	ing procedures), drawing	+ Y - + N -
(4)	vendor surveillance? Does the plan provide for the of changes to requirements (peak power required, etc.)?	i.e., minimum voltage,	+ Y - + N -
	mmunications Is the contractor's electrical organization on distribution	for all documentation	+ Y - + N -
(2)	pertaining to or affecting electrical power man members actively participat design review committees,	agement organization e in cyclic meetings of	+ Y - + N -
(3)	and/or project staff? Does the system provide for internal electrical power stational areas, and all applicate and including the project of the system.	tus reporting to all func- ble management levels up	+ Y - + N -
c. Dis	sciplines Does the project electrical porganization have full responsive trical power management properties with staff graphs.	nsibility for the elec- ogram (i.e., no split	+ Y - + N -

	(2) Is the identity and management level of the control tor's electrical power management organization easily determined from organizational charts (i. no integration of electrical power management or zation elements with other functional areas)?	e., rgani-
	(3) Is the electrical power management organization quately staffed and organized (i.e., accounting, trical power control and analysis, measurement, administrative elements) to effectively accomplise electrical power management program?	elec-
	(4) Does the manager of the electrical power manage organization have access to top management to n recommendations and obtain decisions on electri power problems?	nake + Y - + N -
d.	Training and Education (1) Does the electrical power management organizat actively (i.e., through posters, charts, brochur handbooks, and/or classroom instructions) provi the who, what, why, and methods of electrical pomanagement to functional design elements as we as the appropriate project management elements	es, ide ower 11
	(2) Is the training and education program to be main on a continuous basis throughout the lifetime of t project?	
e.	Judgments (1) Are the decisions which involve electrical power within the framework of performance, cost, sche and reliability trade-off effects? (A positive and should be supported by actual documentation.)	edule,
	(2) Are management decisions affecting electrical pagreed to by cognizant electrical power managements personnel?	' I - ' IV -
f.	Technical (1) Is the contractor's electrical power management gram effective through the conceptual, definition design, test, and checkout phases and in compliant test.	ance
	with NASA approved standards and/or specificat: (2) Does the electrical power management organizat have cognizance over (or access to) electrical potrade-off assessments, and corresponding electropower evaluations?	ower + Y - + N -

QUALI'	TATIVE EVALUATION NO	DATE	
CENTE	ER	CONTRACTOR	
CONTE	RACT NO	STAGE/MODULE	
RATIN	G OFFICIAL	Name and Title	
Classif	fication: 4. ELECTRICAL POW	ER ANALYSIS	
Objecti	ive: To determine the extent and performed design optimizat quirement analyses as appl power.	ion, trade-off and re-	
	anning Is there an overall project developrovides for continuous design timize electrical power properware problems under continuous they solved only when they becomes	assessments to op- rties (i.e., are hard- us assessment or are	+ Y - + N -
(1)	ommunications Does the electrical power man supply analytical inputs to des control, and project staff mee Is the electrical power managificiently informed of the resul implement effective follow-up	ign review, change tings? ement organization suf- ts of such meetings to	+ Y - + N -
	sciplines) Does the electrical power manifectude a technical analysis electrical power manifectude as technical analysis electrical analysis ele	nagement organization	+ Y - + N -
(1	raining and Education) Are the electrical power contraining and result matrices dunderstood by the laymen?) Have the developed techniques been provided to cognizant NA and comment?	ocumented and readily and typical results	+ Y - + N -
	idgments) Have management and design trical power been based on tea (within the purview of cost, se	chnical assessments	+ Y - + N -

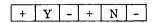
and reliability)?

(2) Is the time lag from the decision date to actual implementation reasonable (i.e., not greater than two working days)?

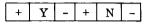


f. Technical

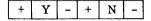
(1) Have design constraint ground rules and quantitative values been established in sufficient depth to allow specification electrical power criteria to be defined and evaluated?



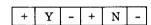
(2) Have analyses of electrical power uncertainties been accomplished for use in overall system error analyses, to verify nominal values analytically, and to assist in identifying elements of hardware requiring test verification (a positive answer requires tangible evidence of such studies)?



(3) Do the contractor's electrical power assessments provide for the early detection of potential weaknesses and system interface incompatibilities through systematic trend evaluations of system growth and performance changes?



(4) Are the performed assessments (i.e., in reference to established specification, contract end item, and/or scope change quantitative definitions) compatible with the results of NASA technical assessments?



QUALI'	rative evaluation no	DATE	
CENTE	ER	CONTRACTOR	
CONTR	ACT NO	STAGE/MODULE	
RATIN	G OFFICIAL	Name and Title	
Classif	ication: 5. DESIGN MONITOR	NG	
Objecti	ve: To establish the depth and electrical power design mo		
	Anning Are all functional systems con (i.e., on a scheduled basis) for changes? Are functional system design lar basis?	or electrical power	+ Y - + N -
(3)		cification and drawing	+ Y - + N -
b. Co (1)	mmunications Does the cognizant electrical in and/or receive the results review?		+ Y - + N -
(2)		ew which may compro-	+ Y - + N -
(3)	5	ition for all indexes, inges, and parts lists	+ Y - + N -
(4)	Does it appear that the electrorganization is at all times in with the remainder of the eng drafting groups?	complete communication	+ Y - + N -
	when the electrical power ma does not concur with the draw tion, or change, do they trans directly to the originating uni communication documented un lution of the problem is obtain	ing, design specifica- smit their comments t, and is subsequent ntil a satisfactory reso-	+ Y - + N -

•	(2)	Is the electrical power management organization included in the contractor's engineering sign-off procedure?	+ Y - + N -
	(3)	Do all drawings and changes indicate date of review, the reviewer, and do they include an electrical power block?	+ Y - + N -
	(4)		+ Y - + N -
d.	Tra	ining and Education	
	(1)	Are the design monitoring procedures and techniques documented, readily understood, and available to personnel receiving on the job training?	+ Y - + N -
	(2)	Are the aforementioned procedures straight-forward, feasible, and a true representation of the electrical power management organization's design monitoring activity?	+ Y - + N -
e.	Jud	gments	
	(1)	Are the reasons advanced by the contractor in justification of his mode of design monitoring sound and practical in the overall engineering sense?	+ Y - + N -
	(2)	Will the contractor's method of design monitoring provide results which will support sound management decisions?	+ Y - + N -
f.	Tec	chnical	
	(1)	Are percents of estimated, calculated, and actual figures an integral part of the electrical power management system?	+ Y - + N -
	(2)	•	+ Y - + N -
	(3)		+ Y - + N -
	(4)		+ Y - + N -

QUALIT	TATIVE EVALUATION NO	DATE	
CENTE	R	CONTRACTOR	
CONTR	ACT NO	STAGE/MODULE_	
RATING	G OFFICIAL	Name and Title	
Classif	ication: 6. SUBCONTRACTOR	AND VENDOR SURVEILL	ANCE
Objecti	ve: To determine the effectiven electrical power manageme forced by the contractor on vendors.	nt program being en-	
	chase orders and/or specifical specify limiting electrical pow be met or bettered?	forts? ent specifications, pur- tion drawings clearly er limits which must for major items of ted to follow electrical	+ Y - + N - + Y - + N -
b. Co (1) (2) (3)	organization reponsible for mo and vendor efforts? Is there a clearly defined proc compliance with established re	edure for assuring equirements? design reviews in-	+ Y - + N - + Y - + N -
c. Dis (1)	organization or its representation (i.e., within the limits of the subcontractor and vendor electrical power management of the contractor satisfied with the contractor satisfied with the contractor satisfied with the	tive have authority contract) to direct the trical power effort? a the subcontractor's effort? minimum discipline uired of the contractor	+ Y - + N - + Y - + N -

d. Training and Education

(1) Does the subcontractor meet minimum electrical power training and education requirements similar to those requirements of the contractor in item d. of classifications 2 thru 5, and 7 thru 9?



e. Judgments

(1) Does the subcontractor meet minimum judgment standards similar to those delineated in item e. of classifications 2 thru 5, and 7 thru 9?



f. Technical

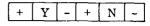
(1) Does the subcontractor meet minimum technical standards similar to those delineated in item f. of classifications 2 thru 5, and 7 thru 9?



QUALI'	TATIVE EVALUATION NO	DATE	
CENTE	R	CONTRACTOR	
CONTR	ACT NO.	STAGE/MODULE	
RATIN	G OFFICIAL	Name and Title	
Classif	ication: 7. MEASURED DATA		
Objecti	ve: To establish the adequacy tractor's electrical measu	-	
a. Pla (1)	and milestone schedule) elec-	, .	+ Y - + N -
(2)	ment program? Does the plan provide for any requirements for measurements curacy verification (i.e., caserror analyses), for electric documentation, subsequent descripting?	ents, for facility ac- libration and attendant al measurement result	+ Y - + N -
	ommunication Does the contractor's electric organization have cognizance measurements (i.e., in the spared or concurred in measurements)?	over all electrical sense of having pre- crement procedures	+ Y - + N -
(2)			+ Y - + N -
e. Di (1)	incoming equipment and cont ware strictly enforced? (An quires a documented procedu	ractor fabricated hard- affirmative answer re- are which includes	+ Y - + N -
(2)	periodic quality control checo Is a NASA representative (at present when specification re be verified?	least an inspector)	+ Y - + N -

d. Training and Education

(1) Are electrical measurements performed by qualified personnel? (An affirmative answer should be verified by a personnel checkout or training record.)

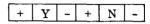


e. Judgments

(1) Has the contractor performed studies to support his judgments on which electrical properties (including sub-assemblies equipment and total vehicle) require verification?

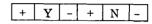


(2) Has the contractor developed, acquired, and maintained electrical measurement equipments and/or facilities that are consistent with the precisions, accuracies, and/or tolerances to which he is contractually obligated?

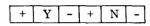


f. Technical

(1) Have facility accuracies been verified (i.e., are approved facility error analyses and calibration reports available)?



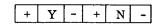
(2) Have all measurement procedures been approved by NASA in accordance with NASA SP-6005 or its equivalent?



QUA	ALITATI	VE EVALUATION NODATE	······································
CEN	NTER	CONTRACTOR	
CON	TRACTO	OR NOSTAGE/MODULE	
RAT	ring OF	FICIALName and Title	
Clas	ssificatio	on: 8. ELECTRICAL POWER CONTROL ASSURANCE	Ε
Obj€		To determine if the contractor is exerting sufficient effort to design and fabricate vehicle stages and modules to meet or better specification electrical power requirements.	
a.	plan dete	ss the contractor's electrical power management in provide for the establishment of procedures for ecting electrical power weaknesses before they ome critical? (Refer to classification 4. item	+ Y - + N -
b.	(1) Are	nications detected anomalies communicated directly to ject management, cognizant engineering groups, NASA representatives?	+ Y - + N -
c.	effe whe	es project management take prompt action in ecting trade-off and alternate design analysis en specific electrical power properties are shown have a high probability of exceeding specification	+ Y - + N -
d.	(1) Has	g and Education the contractor provided sufficient evidence and wledge of trade-off assessments which are dictive in nature?	+ Y - + N -
e.	in a pow can rec	re the judgments made to date by the contractor assuring the meeting or bettering of electrical rer requirements been sound and timely? (This be verified by examining actual measurement ords and comparing them to target, control limit, specification requirements.)	+ Y - + N -

f. Technical

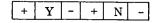
(1) Has the contractor developed and applied analytic procedures and techniques to verify and optimize electrical power trade-offs? (An affirmative answer requires tangible evidence in the form of reports.)



QUALIT	TATIVE EVALUATION NO	DATE	-
CENTE	RCONTRA	ACTOR	-
CONTR	ACT NOSTAG	E/MODULE	_
RATING	G OFFICIALName	e and Title	_
Classif	ication: 9. SUBMITTALS		
Objecti	ve: To determine the adequacy and timelines contractor's internal and external (NASA power reporting system.		
(1) (2)	Does the contractor's submittal schedule of that of NASA SP-6005 or its equivalent? Does the contractor disseminate internal supports in accordance with a planned schedule Are reports submitted to NASA on a vehicle number basis?	etatus re- le?	
(1)	mmunication Are the formats and functional codes of NA or its equivalent adhered to by the contract Are the internal reports furnished to the fu design groups of sufficient depth to assure understanding of existing or predicted electrower problems? (They should include curstatus, trends, targets, control limits, and formance trade-off effects as appropriate.	tor? unctional]
	Has the contractor made a concentrated eff meet scheduled submittal dates? (This can verified by checking NASA dates of receipt Is the internal reporting schedule reasonab to? (This can be verified by reviewing the file copies of internal reports.)	n be ts.) bly adhered + V - + N -	
d. Tr (1)	aining and Education Do the reports submitted to NASA and the cinternal reports meet minimum profession dards? (Do they reflect an understanding electrical power management requirements	nal stand- of overall	-

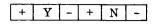
e. Judgments

(1) Do the reports submitted to NASA consistently reflect the design base to which they are referenced? (This can be verified by reviewing the contractor's qualifying statements and technical descriptions contained in said reports.)



f. Technical

(1) Does the contractor provide detail electrical power analyses as required by NASA SP-6005 or its equivalent?



	TO DIVIDE IX BY YER IN TI ENGINEERING IN TI TI PROFICIENCY	09	60	170	120	061	120	011	09	001	XIII IX OVERALL	BY 990 ADM. FNTER PROF				
		·										,	_	f line I)		
FORM	D MUS III										*			o mns jo		
NG F	F TECHNICAL					-						170		(must equal sum of line I)		
RATING	3 JUDGMENTS											130		COL. 1V (r		
PROFICIENCY	TRAINING &											120		* SUM OF CO		
OFICI	DISCIBLINES											061		₹ 8		
II PR	COMMUNICATIONS											061				
TABLE	PLANNING											061				
TAE	OBJECTIVES	I PREPAREDNESS AND ATTITUDES	2 FORMULATION OF REQUIREMENTS	3 FORMULATION OF MASS PROPERTIES CONTROL SYSTEM	4 MASS PROPERTIES ANALYSIS	5 DESIGN MONITORING	6 SUB-CONTRACTOR AND VENDOR SURVEILLANCE	7 MEASURED DATA	8 MASS PROPERTIES AND PERFORMANCE ASSURANCE	9 SUBMITTALS	I SUM I THRU 9	I DIVIDE IBYIL AND ENTER IN III	III ADMINISTRATIVE PROFICIENCY			

40 & PICAS

TABLE III - FINAL REPORT - SAMPLE OUTLINE

ELECTRICAL POWER MANAGEMENT SURVEY FINAL REPORT

	Date
1.	(a) Organization Surveyed:
	(b) Contract No.:
	(c) Surveyed By:
	(d) Date of Survey:
2.	CONCLUSIONS:
	(a) through (i) - Paragraphs summarizing results of survey for each of the nine classifications, with particular emphasis on problem areas.
	(EXAMPLE)
	(f) Subcontractor and Vendor Surveillance: A critical problem exists, as evidenced by failure to meet electrical power specifications, of 47% of delivered items to date. Such failure to meet specification involves more than one-third of all subcontractors who have electrical power specifications to meet. Apparent causes are:
	(1) Failure by contractor to require Electrical Power Management Program on the part of subcontractors.
	(2) Failure to exercise detailed monitoring of subcontractor design activities.
3.	RECOMMENDATIONS.
	Recommendations for improvement of contractor's Electrical Power Management Program, and directives for actions to resolve critical problem areas.
	(EXAMPLE)
	(g) Submit evidence within sixty days that adequate Electrical Power Management requirements have been imposed on all subcontractors.

(h) Submit within 30 days plans for regular, detailed, quantitative, monitoring of subcontractor Electrical Power activities.

4. SURVEY DISCUSSION

(a) General discussion of critical survey results.

- (b) Contractor cooperation in survey.
- (c) Adequacy of contractor preparation for survey.
- (d) Consistency between verbal answers and substantiating evidence.
- (e) Contractor innovations in Electrical Power Management, and areas of outstanding performance. (These may be applicable to improving the performance of other contractors.)

5. ATTACHMENTS

Detailed results and data to substantiate, clarify, or expand on items covered in the report.

N65-33831

ERRATA

NASA SP-6007

ELECTRICAL POWER MANAGEMENT SURVEY MANUAL

September 1, 1965

Page 29: Table II Proficiency Rating Form should be replaced with the attached table.

•	PROFICIENCY VI ENGINEERING										IX	ENG. 8 ADM.	PROF.
	V DIVIDEIV BY V AND ENTER IN VI	09	9	170	120	190	120	110	9	100	VIII	VII BY 990	ENTER IN IX
	IV SUM a	110			* IIA								
FORM	I TECHNICAL											170	
RATING F	€ 10DGWENIS				_							130	
	TRAINING & GEDUCATION											120	
PROFICIENCY	c DISCIBLINES											190	
II	P COWMONICATIONS											190	
TABLE	S PLANNING											190	
	OBJECTIVES CLASSIFICATION	1 PREPAREDNESS AND ATTITUDES	2 FORMULATION OF REQUIREMENTS	3 FORMULATION OF ELECTRICAL POWER MANAGEMENT SYSTEM	4 ELECTRICAL POWER ANALYSIS	5 DESIGN MONITORING	6 SUB-CONTRACTOR AND VENDOR SURVEILLANCE	7 measured data	8 ELECTRICAL POWER CONTROL ASSURANCE	9 SUBMITTALS	I SUM 1 THRU 9	II DIVIDE I BY II & ENTER IN III	III ADMINISTRATIVE PROFICIENCY

* SUM OF COL. IV (must equal sum of line 1)